

**S. P. Mandali's**  
**Ramnarin Ruia Autonomous College**

*(Affiliated to University of Mumbai)*



**Syllabus for**

**Program: UG Biotechnology**

**Program Code: RUSBTK**

(Credit Based Semester and Grading  
System for Academic Year 2024–2025)

## GRADUATE ATTRIBUTES

GA	Description
	<b>A student completing Bachelor's Degree in Science program will be able to:</b>
<b>GA 1</b>	Recall and explain acquired scientific knowledge in a comprehensive manner and apply the skills acquired in their chosen discipline. Interpret scientific ideas and relate its interconnectedness to various fields in science.
<b>GA 2</b>	Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans and execute them, organise data and draw inferences.
<b>GA 3</b>	Explore and evaluate digital information and use it for knowledge upgradation. Apply relevant information so gathered for analysis and communication using appropriate digital tools.
<b>GA 4</b>	Ask relevant questions, understand scientific relevance, hypothesize a scientific problem, construct and execute a project plan and analyse results.
<b>GA 5</b>	Take complex challenges, work responsibly and independently, as well as in cohesion with a team for completion of a task. Communicate effectively, convincingly and in an articulate manner.
<b>GA 6</b>	Apply scientific information with sensitivity to values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.
<b>GA 7</b>	Follow ethical practices at work place and be unbiased and critical in interpretation of scientific data. Understand the environmental issues and explore sustainable solutions for it.
<b>GA 8</b>	Keep abreast with current scientific developments in the specific discipline and adapt to technological advancements for better application of scientific knowledge as a lifelong learner

## PROGRAM OUTCOMES

PO	Description
	<b>A student completing Bachelor's Degree in Science program in the subject of Biotechnology will be able to:</b>
<b>PO 1</b>	Adept in basic sciences along with a thorough understanding of biotechnology principles and chemical sciences to create a foundation for higher education with the insights into interdisciplinary approach.
<b>PO 2</b>	Demonstrate the applications of fundamental biological processes from the molecular, cellular, industrial and environmental perspective.
<b>PO 3</b>	Develop effective communication skills with improved individual and team work abilities in the domain of scientific research writing. Showcase their innovative ideas and research work efficiently.
<b>PO 4</b>	Reflect, analyse and interpret information or data for investigating the problem in fields of biotechnology. Acquire scientific and entrepreneur skills to furnish sustainable solutions to coeval problems
<b>PO 5</b>	Illustrate the relevance of ethical implications and standard laboratory practices in tissue culture techniques, forensic biology, developmental biology and other fields of biotechnology.
<b>PO 6</b>	Apply the conceptual knowledge to develop coherent, efficacious and proficient practical, technical and analytical skills.

## PROGRAMME OUTLINE

YEAR	SEMESTER	PAPER	COURSE CODE	COURSE TITLE	CREDITS
FYBSc  I	I	DSC	RUSBTK.O101	Biotechnology I- Fundamentals of biotechnology	3
		DSC	RUSBTKP.O10 1	Practicals based on Biotechnology I- (Fundamentals of biotechnology)	1
		DSC	RUSBTK.O102	Fundamentals of chemistry for biotechnology	3
		DSC	RUSBTKP.O10 1	Practicals based on Fundamentals of chemistry for biotechnology	1
		OE	RUSOEBTK.O 101	Fitness - I	3
		OE	RUSOEBTKP. O101	Practicals based on Fitness - I	1
		VSC	RUSVSCBTKP .O101	Marine Biotechnology	2
		SEC	RUSSECBTKP.O 101	Microscopy and microbial techniques	2
FYBSc  I	II	DSC	RUSBTK.E111	Biotechnology II- Fundamentals of genetics	3
		DSC	RUSBTKP.E111	Practical of Biotechnology-II	1
		DSC	RUSBTK.E112	Bioorganic chemistry	3
		DSC	RUSBTKP.E11 2	Practical of subject 2	1
		OE	RUSOEBTK.E 111	Fitness - II	3
		OE	RUSOEBTKP. E111	Practicals based on Fitness - II	1
		VSC	RUSVSCBTKP .E111	Techniques in forensic	2

				science	
		SEC	RUSSECBTKP .E111	Techniques in tissue culture	2

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**SEMESTER I****Course Code: RUSSECBTKP.O101****Course Title: Microscopy and  
microbial technique****Academic year 2024-25****COURSE OUTCOMES:**

<b>COURSE OUTCOM E</b>	<b>CO DESCRIPTION</b>
<b>CO 1</b>	Describe the principle and working of instruments used in biotechnology laboratories.
<b>CO 2</b>	Enrich and isolate different microorganisms using appropriate culture medium under suitable aseptic conditions. Comment on their maintenance.
<b>CO 3</b>	Comment on and perform the different methods of enumerations.
<b>CO 4</b>	Illustrate the different phases of the growth curve.

**DETAILED SYLLABUS**

<b>Course Code</b>	<b>Course/ Unit Title</b>	<b>Credits</b>
<b>RUSSECBTKP.O 101</b>	1.Components and working of Simple, Compound, Dark Field 2.Monochrome Staining, Differential Staining, Gram Staining, and Acid-Fast Staining and Romanowsky Staining 3.Special Staining Technique for Cell Wall, Capsule and Endospores and Fungal Staining, Lipid granules, metachromatic, flagella, spirochetes 4.Motility test 5.Sterilisation of Laboratory Glassware and Media using Autoclave 6. Study of Seitz Filter 7.Disinfectant assay 8.Aseptic transfer technique 9.Preparation of Media- Nutrient broth and Agar, MacConkey Agar, Sabouraud's Agar 10. Isolation of Organisms, Macroscopic and microscopic studies: T-streak, Polygon method, Colony characteristics of microorganisms 11. Enumeration of microorganisms: Serial Dilution, Pour Plate, Spread Plate Method, Nephelometry, Haemocytometry, Breeds count 12. Growth Curve of <i>E. coli</i> 13. Effect of pH and temperature on growth of organisms	<b>2</b>

	14. Slide culture technique 15. Contact slide method	
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**SEMESTER II**  
**Course Code: RUSSECBTKP.E111**  
**Course Title: Techniques in tissue culture**  
**Academic year**  
**2024-25**

**COURSE OUTCOMES:**

<b>COURSE OUTCOME</b>	<b>DESCRIPTION</b>
<b>CO 1</b>	Enlist requirements for establishing and maintaining cell culture in laboratory
<b>CO 3</b>	Elaborate on the sterility measures to be followed in animal and plant tissue culture laboratories
<b>CO 4</b>	Assess and select appropriate glasswares/ plastic wares and other basic equipments
<b>CO 5</b>	Design and perform suitable experiments related to tissue culture techniques

**Course Code: RUSSECBTKP.E111**  
**Course Title: Practicals Based on SEC**

**DETAILED SYLLABUS**

<b>Course Code</b>	<b>Course/ Unit Title</b>	<b>Credits</b>
<b>RUSSECBTKP.E111</b>	<ol style="list-style-type: none"> <li>1. Working and use of various Instruments used in tissue culture lab (Filter Assembly, LAF, pH metre and CO2 incubator)</li> <li>2. Aseptic Transfer Techniques in tissue culture</li> <li>3. Laboratory Organization and Layout for Plant and Animal Tissue Culture Laboratory</li> <li>4. Laboratory Organization and Layout for Plant and Animal Tissue Culture Laboratory</li> <li>5. Preparation of Stock Solutions and Preparation of Media for PTC</li> <li>6. Surface Sterilisation and inoculation of seeds in suitable media.</li> <li>7. Induction of Callus Culture</li> <li>8. Preparation of Artificial seeds</li> <li>9. Media Preparation and Sterilisation (ATC)</li> <li>10. Sterility testing for ATC media</li> <li>11. Trypsinization of Tissue and Viability Count</li> <li>12. Dissection of chick embryo</li> <li>13. Formation of Monolayer from chick embryo cells</li> <li>14. Subculturing of adherent cells</li> <li>15. Cryopreservation and thawing</li> <li>16. Growth curve analysis</li> <li>17. Migration assay</li> <li>18. Microscopic study of normal and transformed cell line</li> </ol>	<b>1</b>

**MODALITY OF ASSESSMENT****SEC**

**Practical Examination Pattern:  
(Semester end practical examination): 50 Marks**

<b>PARTICULARS</b>	<b>MARKS</b>
Lab work	40
Journal	5
Viva	5
<b>TOTAL</b>	<b>50</b>